Developing the Air Traffic Controller-Computer Human Interface for Controller-Pilot Data Link Communications (CPDLC)

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FAA AUATAC

History

- Successful Air Traffic Controller, Management, and Vendor User Teams Brought Us From...

Yesterday to Today

Successful En Route User Teams

- VSCS-SRT (Voice Switching & Control System - System Requirements Team)
- DSR (Display System Replacement) Tiger Team
- ATDET (Air Traffic DSR Evolution Team)
- URET (User Request Evaluation Tool) Team
- ATCUT (Air Traffic CPDLC User Team)
- ERAM (En Route Automation Modernization) Air Traffic Team

Team Commonalties

- Composition
  - Air Traffic Controllers - Field and Union Headquarters
  - Air Traffic Management - Field and Headquarters
- Interface with Vendor
- Operational Suitability Testing
- Empowered to Suggest, Refine, and Approve
  - CHI (Computer-Human Interface)
  - Requirements
- Consensus Decision Making

Team Commonalties (continued)

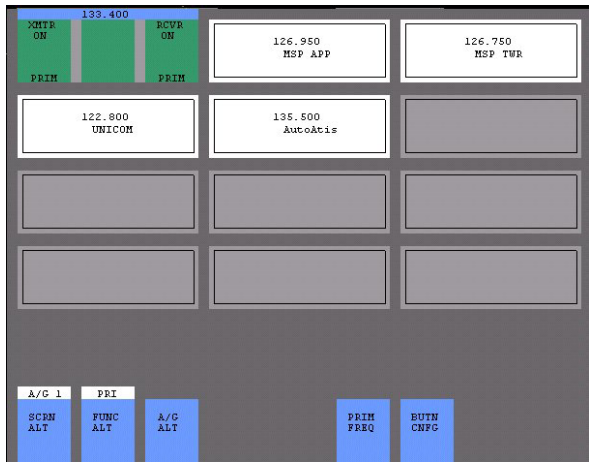
- Testing and Evaluation
  - At Vendor
  - At WJHTC (William J. Hughes Technical Center)
- On-site Training and Familiarization
- Refine Designs
  - Controller Feedback
  - New Technology

VSCS System Requirements Team

- VSCS Replaced
  - WECO-300 (Western Electric 300 Telephone Switch)
  - FAA Four-Channel Radio Equipment

vscs

- With
  - Configurable Air-Ground and Ground-Ground Communications Touch-Screen Displays



VSCS In M-1 Control Room

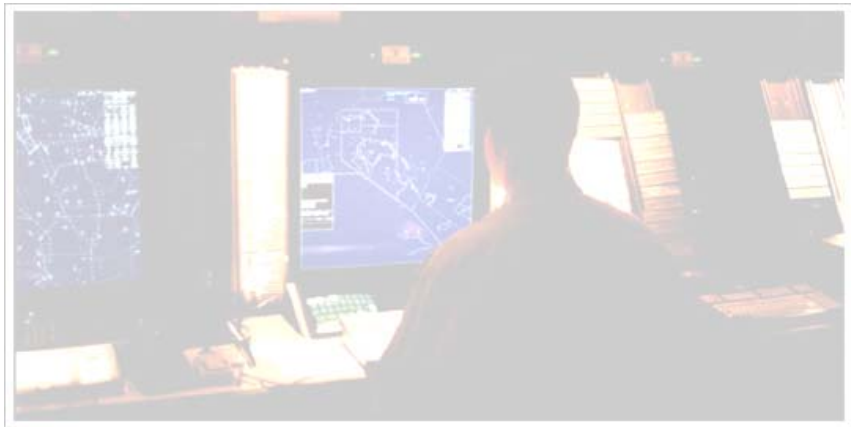
PVD (Plan View Display) to DSR

- PVD (Plan View Display)
  - Analog Display
  - Hardware Controls
    - Knobs
    - Buttons

- DSR (Display System Replacement)
  - Digital Display
  - On-Screen Controls
    - Windows
    - Pointing Device

DSR "Tiger Team"

- Developed Initial Requirements
- Participated in CHI Development
- Conducted Operational Suitability Testing
  - Identified 40 Major Issues
  - 24 Must Be Fixed Prior to IOC (Initial Operating Capability) at Seattle
  - New User Team Formed to Resolve Issues



ATDET (Air Traffic DSR Evolution Team)

- Composition
  - 4 NATCA (National Air Traffic Controllers Association) Bargaining Unit Employees
  - FAA Management and Subject Matter Expert Contractors
- Empowered by MOU (Memorandum of Understanding)
  - Issues to be addressed and fixed before IOC at first sites
  - "Address, at a minimum…
    - Enhanced auto coordination at R-side and D-side workstations;
    - Future use of paper flight progress strips;
    - Integration of new systems, including, but not limited to, Conflict Probe and Data Link…"

ATDET Charter

- ATDET Charter
  - "Role is to…provide guidance throughout design, planning, and deployment activities for all future product improvements and CHI upgrades to DSR.
    - This includes but not limited to URET CCLD and Data Link."
  - "Shall utilize design-build principles…"
  - "This important participation by Air Traffic during the entire development and deployment process will also help ensure that the FAA's planned schedule and budget for this program are realistic and attainable."

ATDET Methodology

- Monthly Meetings
- Research Into Worldwide Technology
- Interface With Other Air Traffic Teams
- Demonstrations From Vendor
- Design-Build
- Evaluation of Prototypes
- Consensus Decision Making
- Operational Testing and Evaluation

First ATDET Improvements

Included

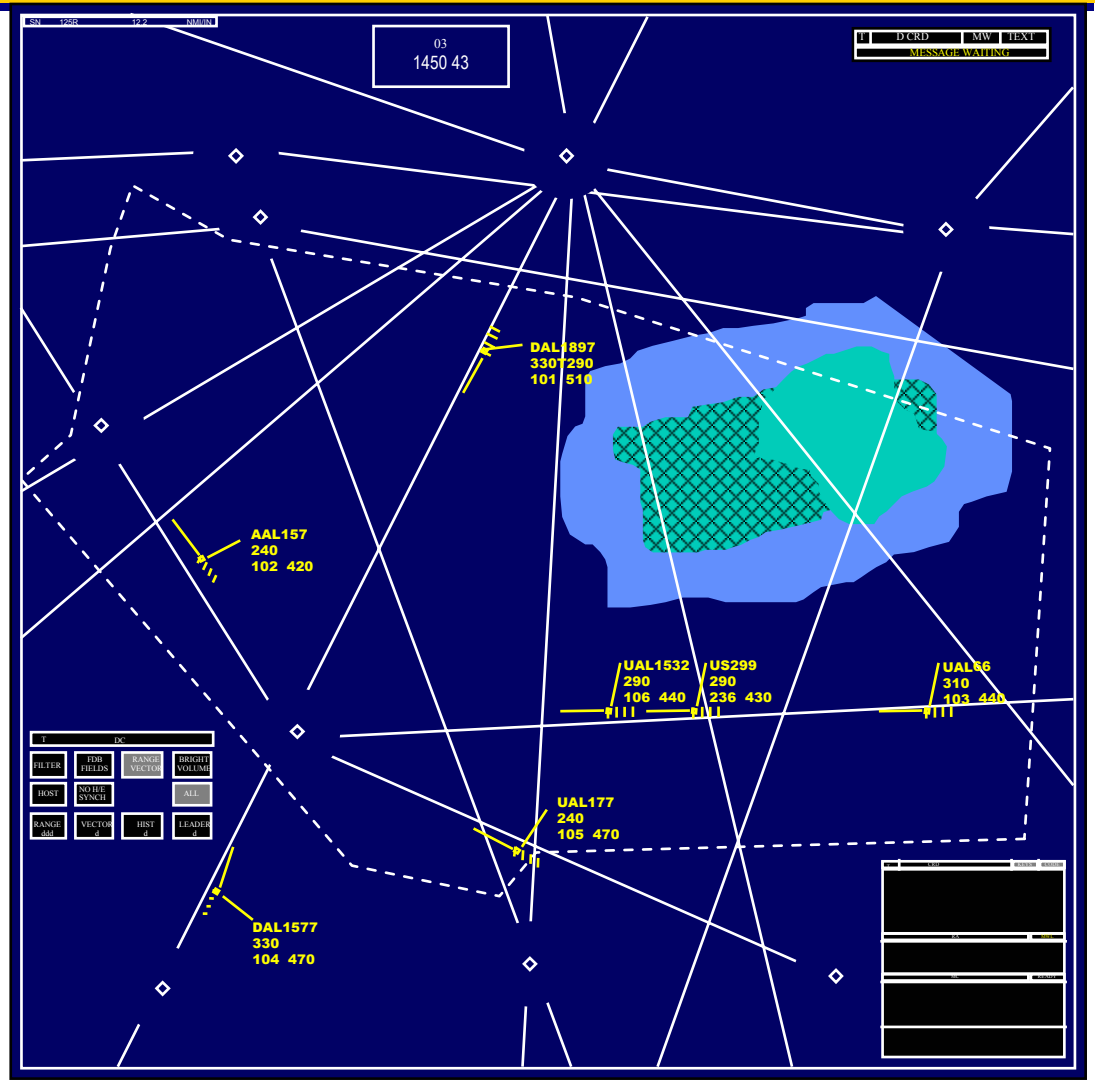
New

Background

And

Data Block

Colors



Situation Display With New Colors

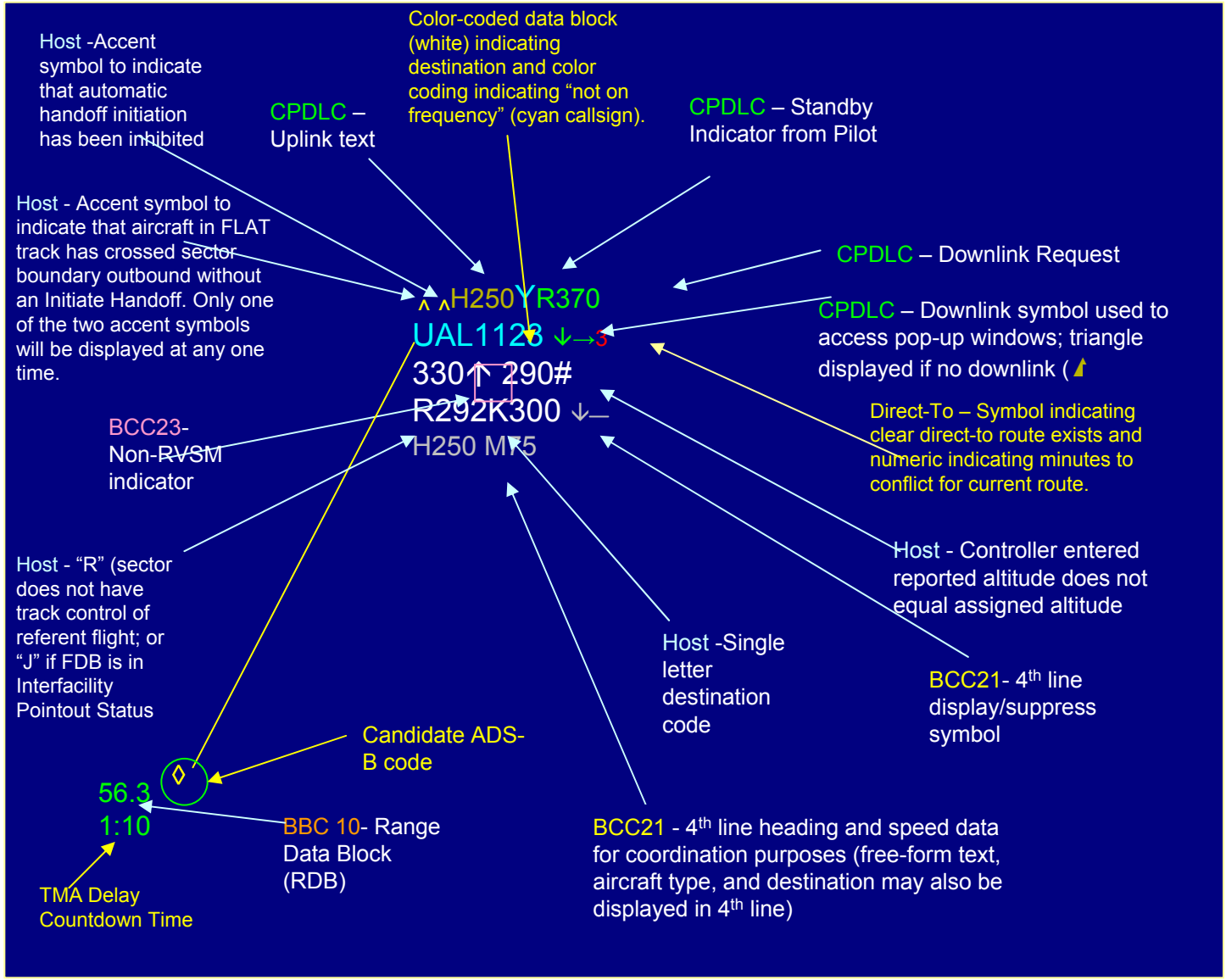
Full Data Block Issues For ATDET

- Adding ALL Proposed CHI

First DSR FDB

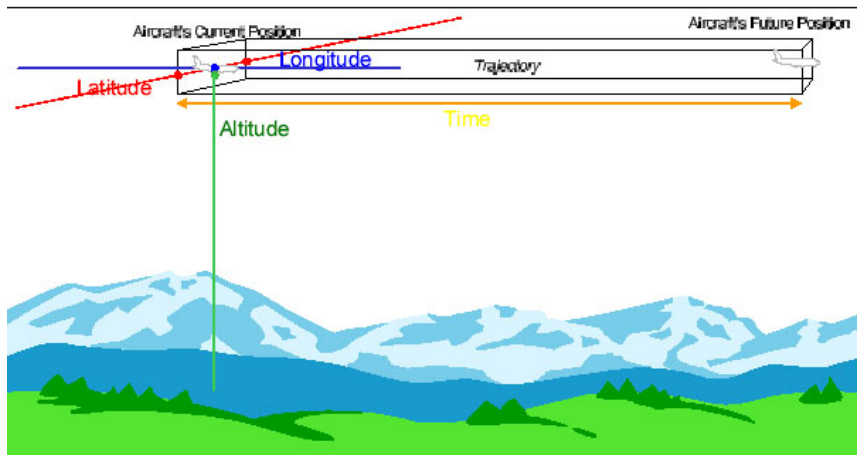
Interactive FDB

Full Data Block Legend



User Request Evaluation Tool (URET)

- Primary Functions
  - Alert Notification
  - Predicted Conflict Notification
  - Conflict Analysis
  - Trial Planning
- Four-Dimensional Trajectory Modeling
  - Longitude
  - Latitude
  - Altitude
  - Time



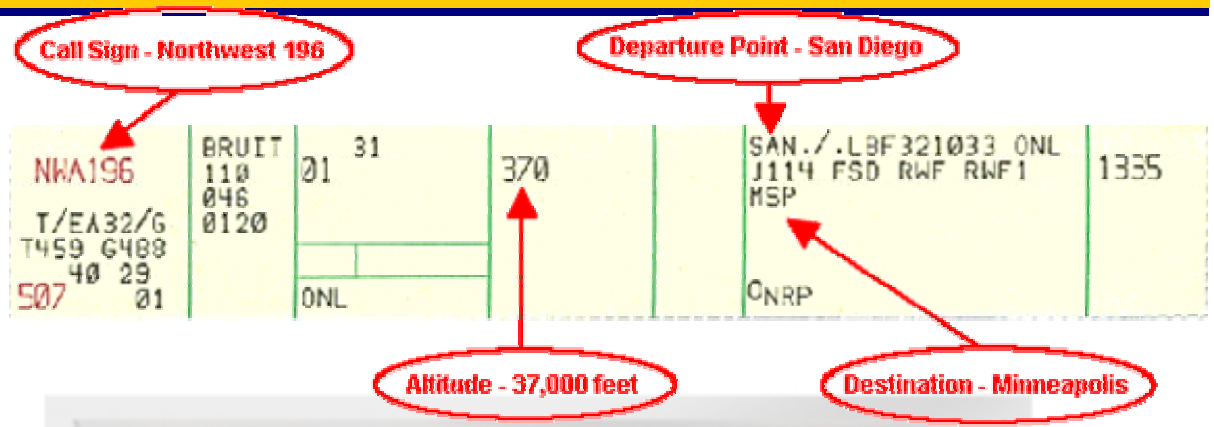
URET Controller Equipment

- Data Controller Position

- 20 x 20 Flat Panel Display
  - Swings-Out Towards Radar Controller Position

URET Replaces Flight Progress Strips

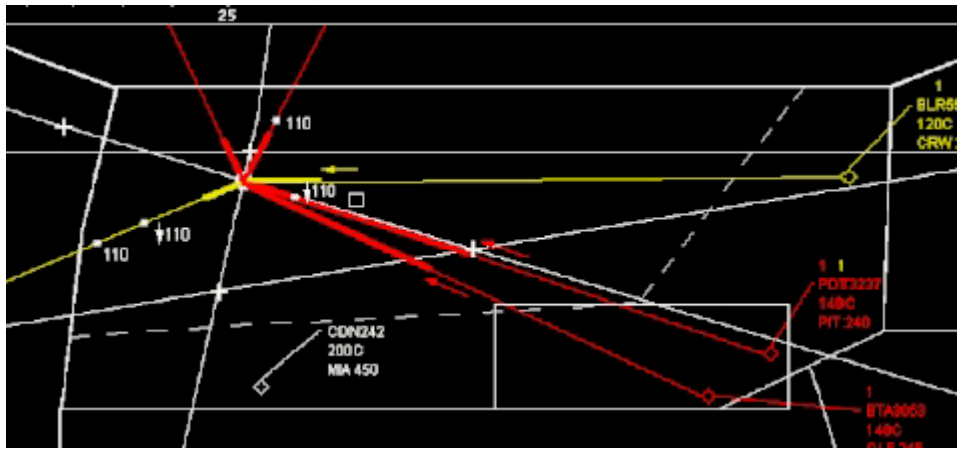
- From This



- To This

URET Graphic Plan Display (GPD)

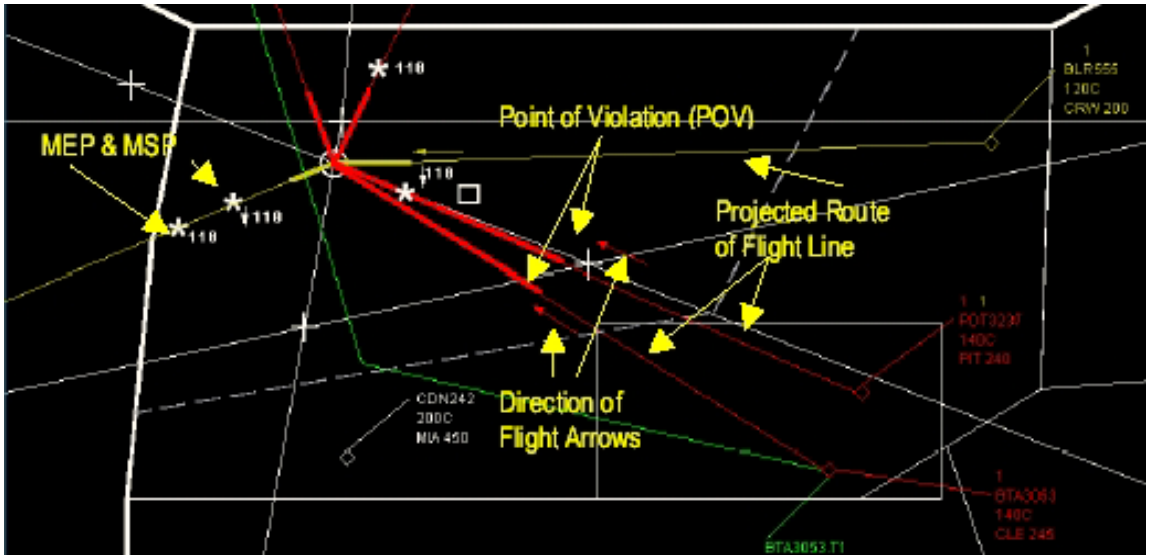
- URET <u>May</u> Interface With CPDLC
  - Pilot Request via CPDLC
  - URET Trial Planning



  - Controller Approves - Sends CPDLC Clearance to Pilot
  - Pilot Acknowledges Clearance via CPDLC
  - URET Automatically Updates Database

URET's Future

- CHI Developed By URET Team and Vendor

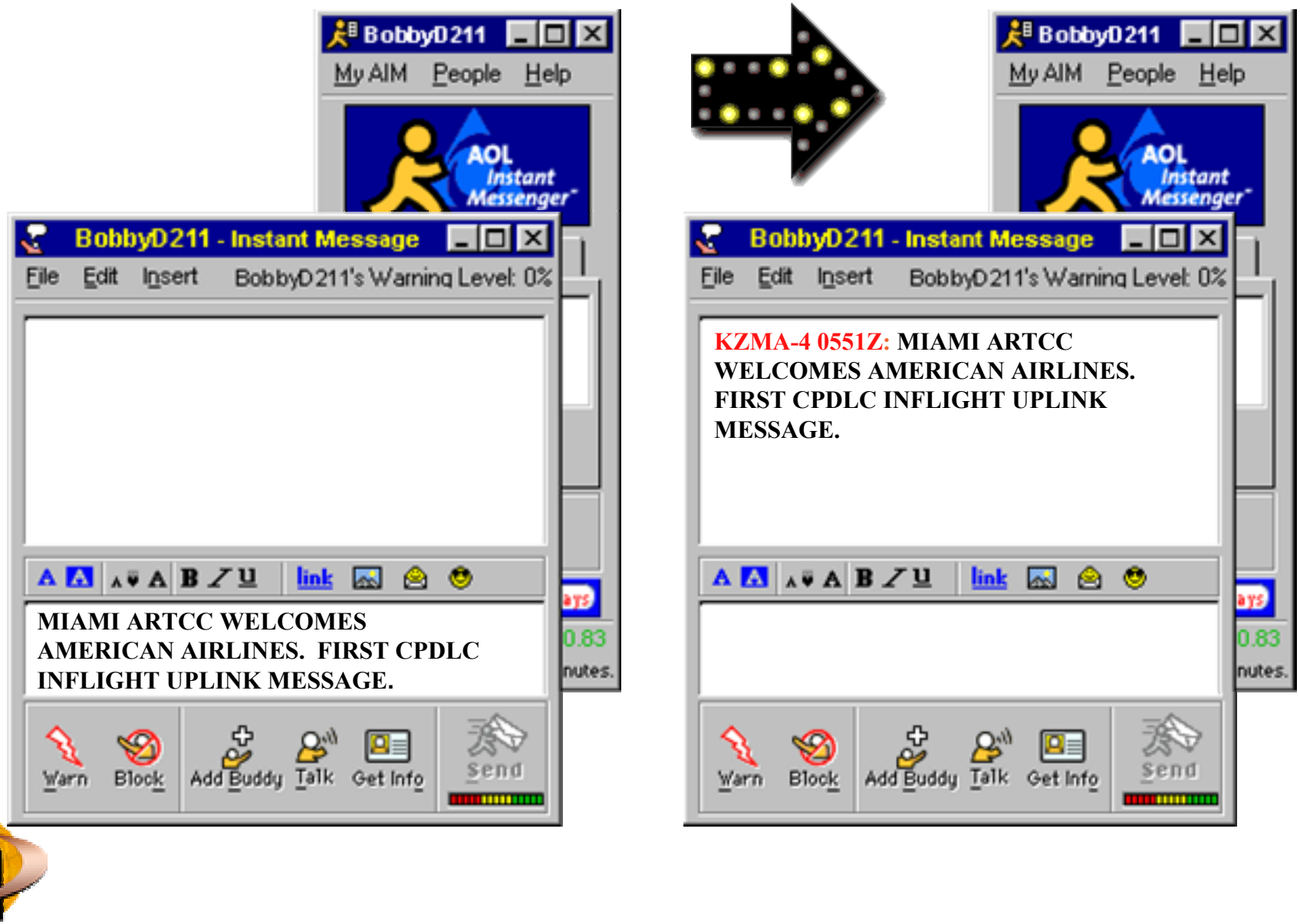


- URET Functionality Will Be Incorporated in ERAM (En Route Automation Modernization)

Data Link

- Controller-Pilot Data Link Communications (CPDLC)
  - Also Implies Pilot-Controller Requests
- ATCUT (Air Traffic CPDLC User Team)
  - Similar to ATDET
  - ATDET Determines Final CHI Design
- CHI Considerations and Questions
  - Use Commercial Off-The-Shelf (COTS) Software?
  - Use Windows / Menus / List Boxes?
  - Use Interactive Data Block?

Use COTS Software???

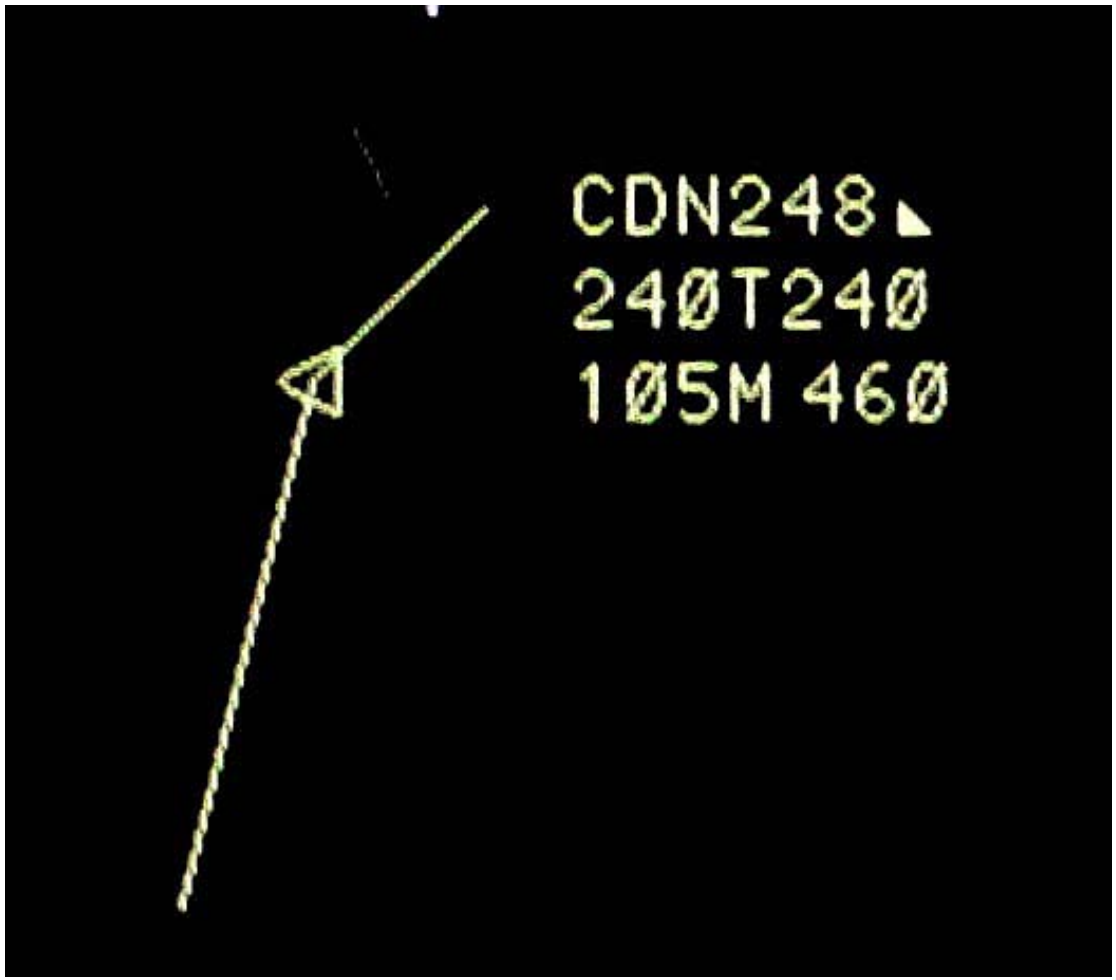


Aircraft Display

Use Windows / Menus / List Boxes?

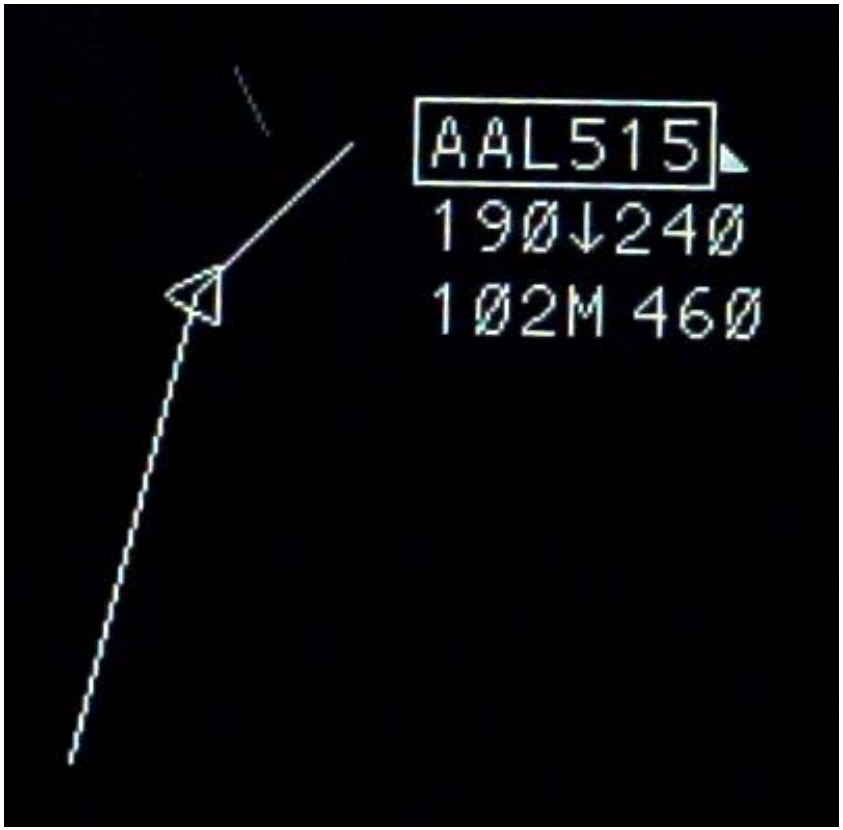
CPDLC Interface Used For First Message at Miami

Interactive Data Block - ATDET



Filled Triangle Indicates Aircraft and Sector Eligibility

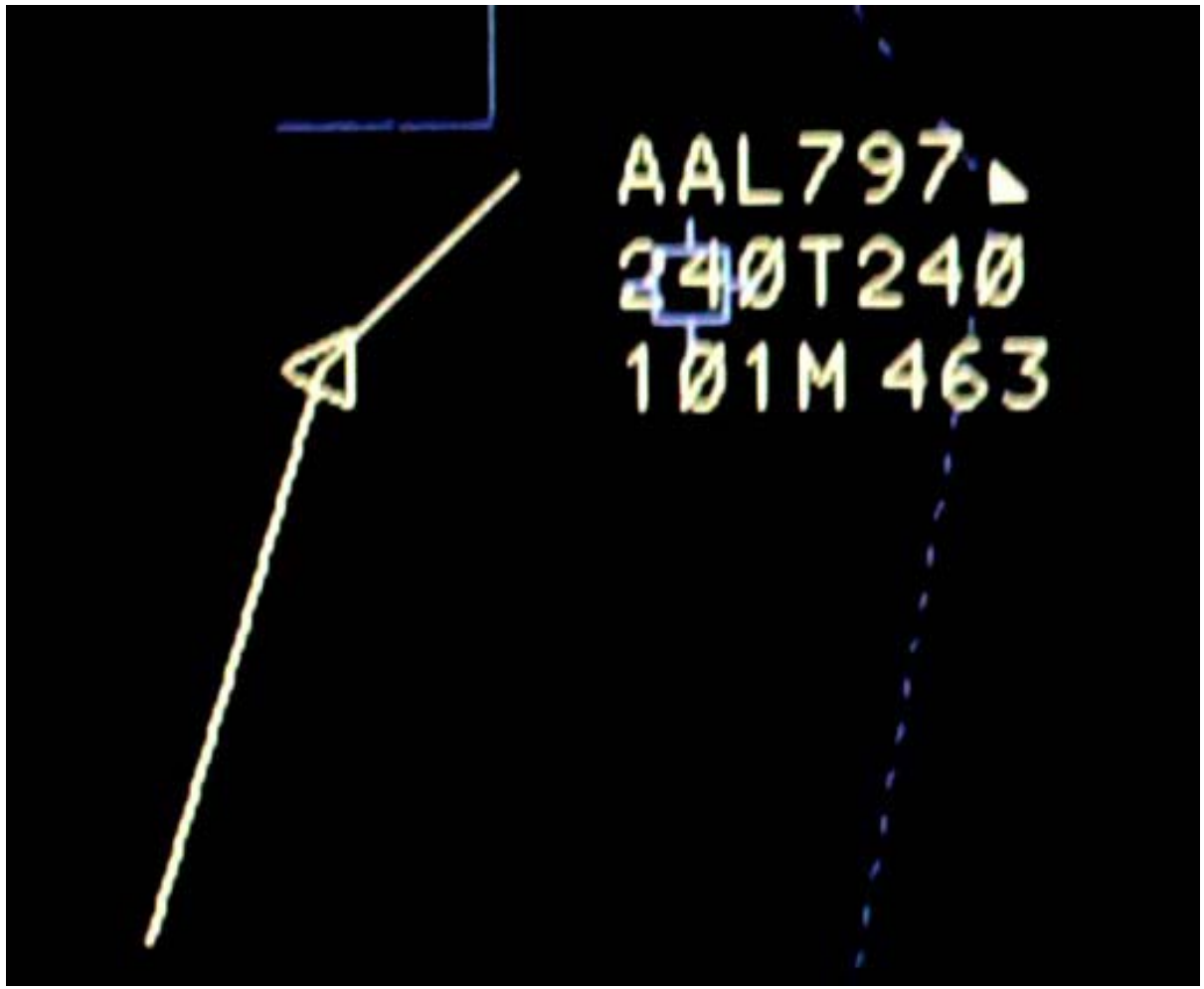
Uplink and Downlink Indicators



Uplink in Progress

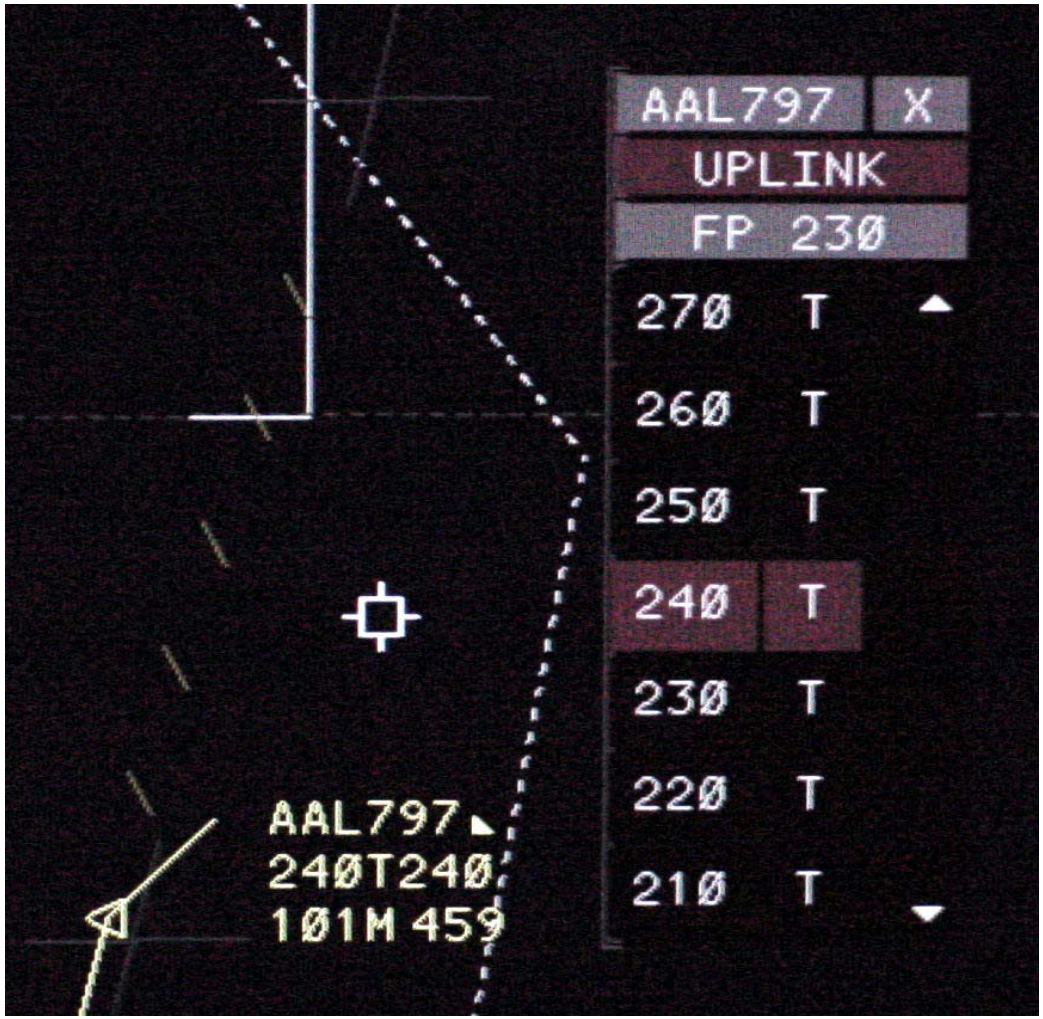
Downlink in Progress

Uplink Altitude CHI



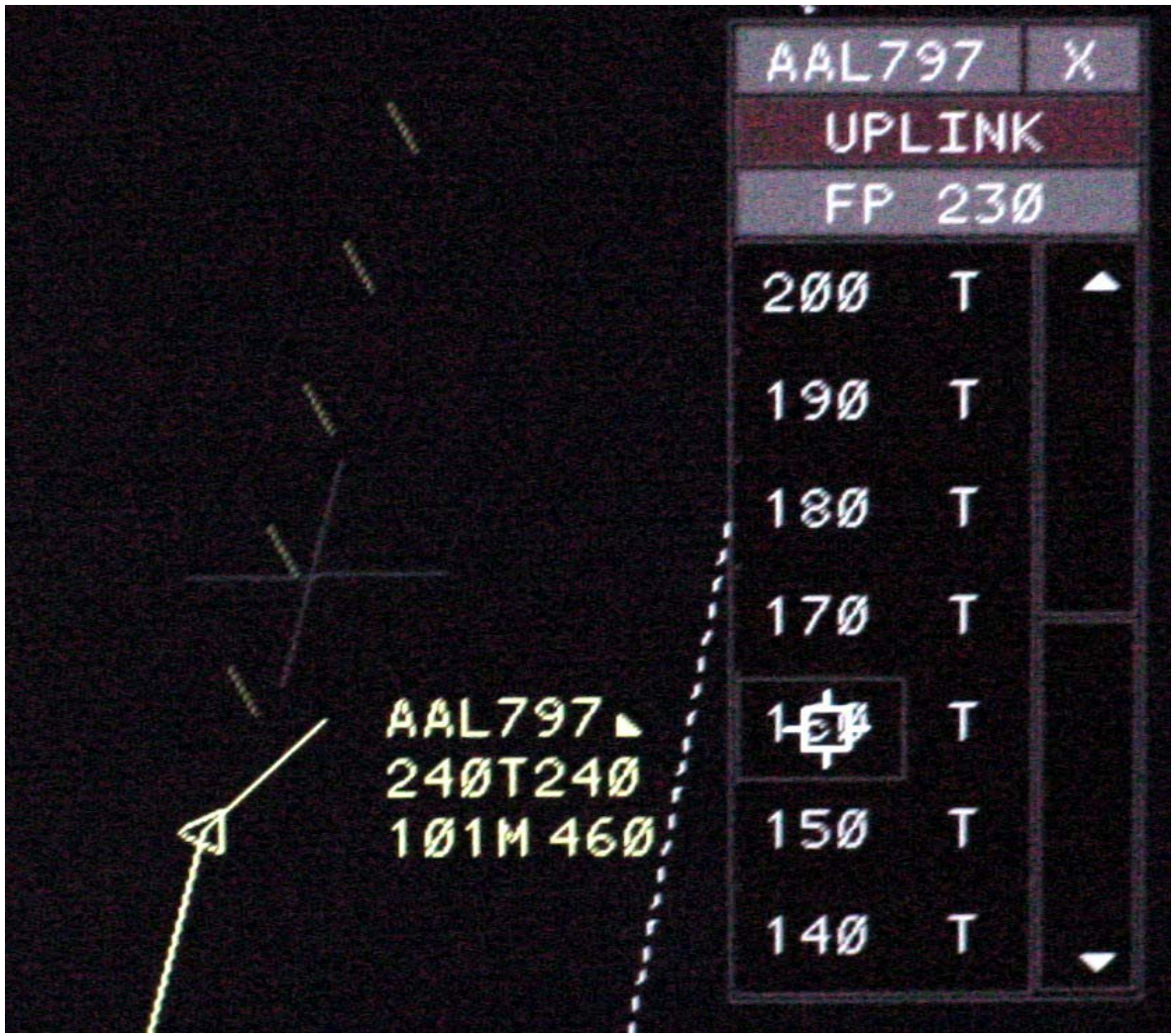
- Place Cursor Over Altitude
- Select

Uplink Altitude Flyout Menu



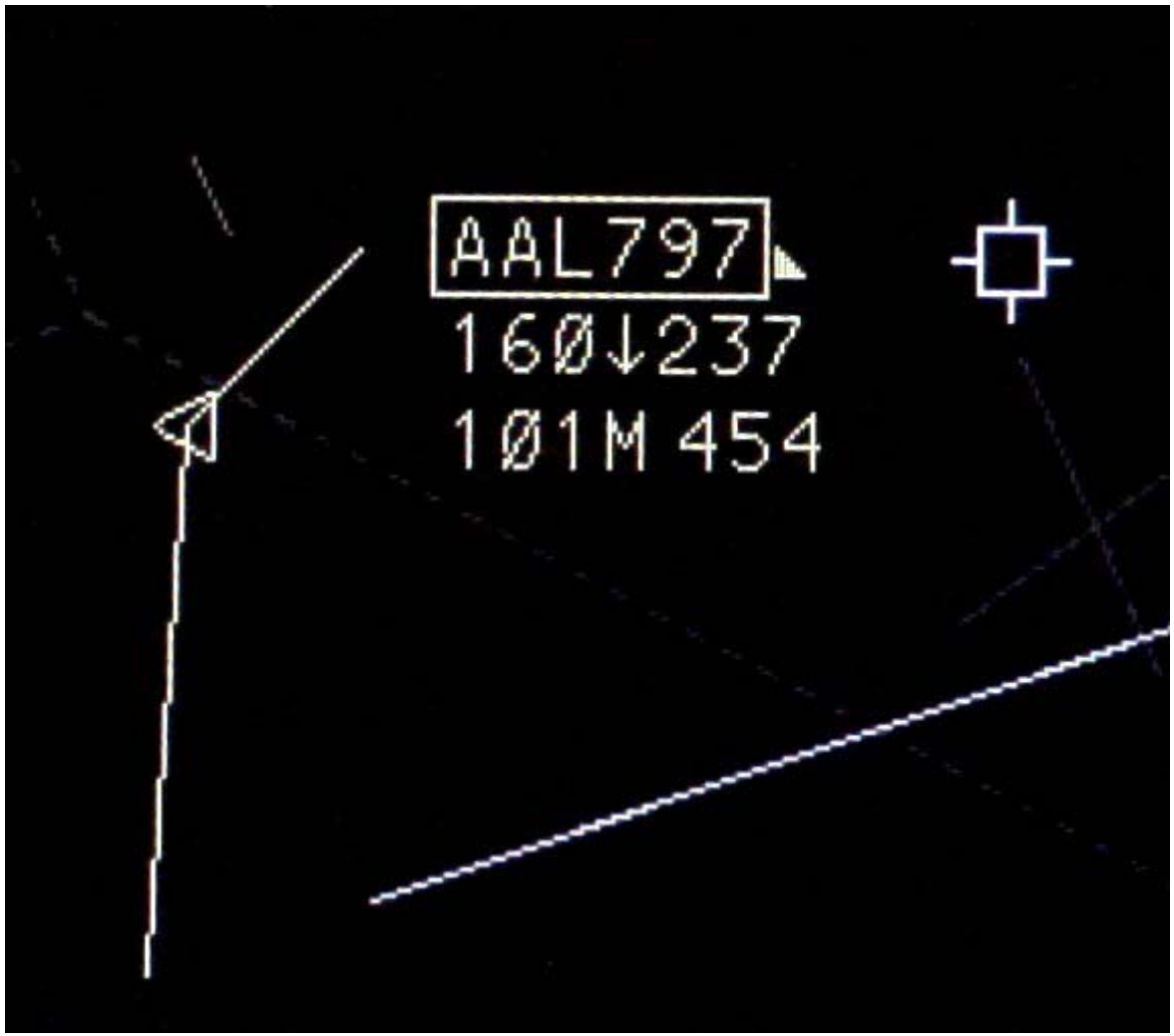
- Flyout Menu Appears, and
- Current Altitude is Highlighted

Select New Assigned Altitude



- Scroll To New Assigned Altitude
- Select

Uplink Indicator and Update



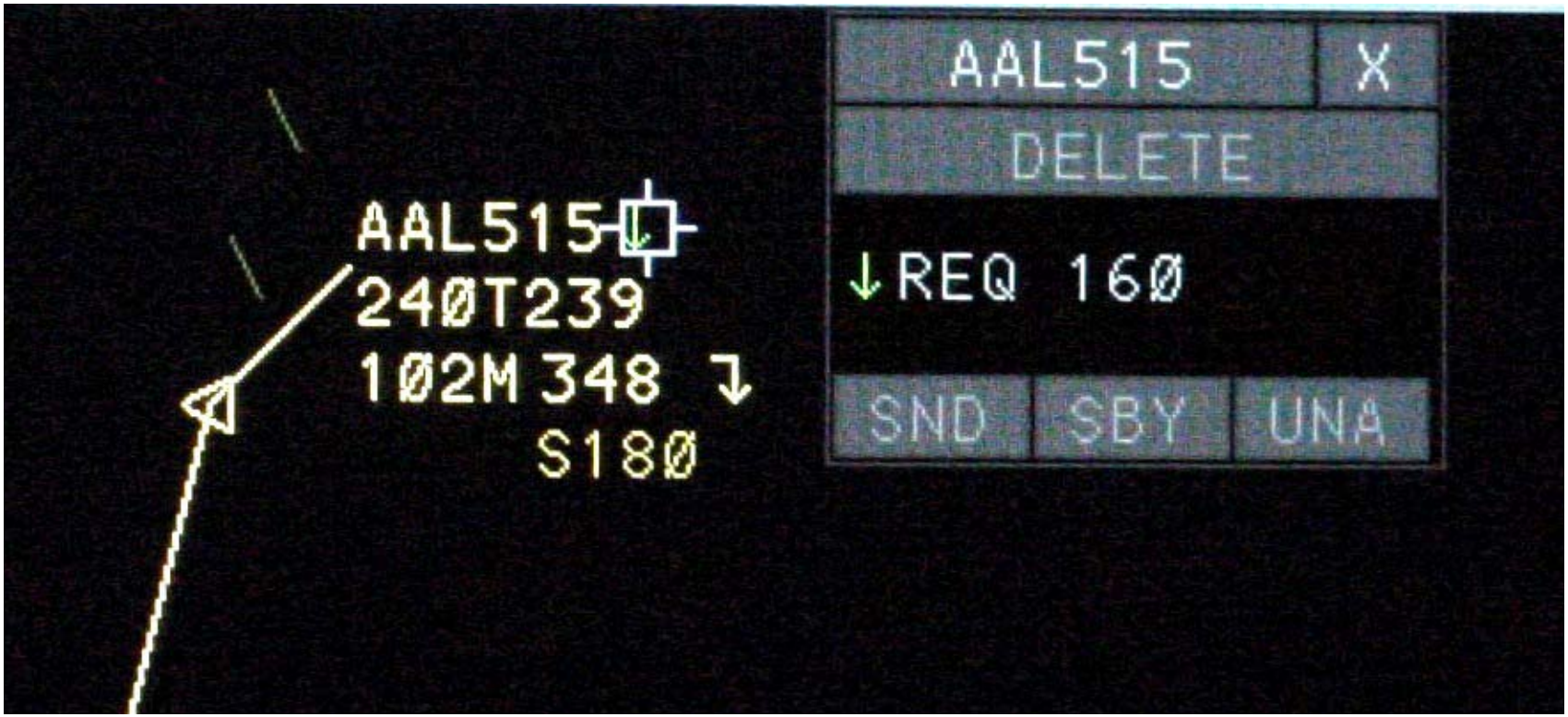
- Uplink Indicator Appears
- Database Updated Automatically

Downlink Altitude CHI

Downlink Request From Aircraft

Downlink Altitude Flyout Menu

- Place Cursor Over Indicator, Then Select
- Downlink Flyout Menu Will Appear



Approve, Standby, Or Unable CHI

- Highlight and Select “REQ” With Cursor, Then
- Select Send, Standby, or Unable Button

Downlink, Approved, & Uplinked

- If Approved (“SND”), Uplink Indicator Appears
- Database Updated Automatically

Other Messages Available

- Speed, Vector, and Textual (e.g., Turbulence)
- Messages Sent Can Be Reviewed With the "DL MSG OUT" Menu

ERAM

- En Route Automation Modernization Will:
  - Replace Outdated Software
  - Replace End-of-Life Hardware
  - Integrate URET Functionality
  - Integrate CPDLC Functionality
  - Benefit User With More Flexible Routing and Airspace Utilization
- Air Traffic ERAM Team
  - Developing New Requirements
  - ATDET Will Determine Final CHI For Controllers

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